Result of Air Enema Reduction in 737 Cases of Intussusception

Anchalee Kruatrachue MD*, Lawan Wongtapradit MD*,
Narong Nithipanya MD*, Warangkana Ratanaprakarn MD*

** Department of Radiology, Queen Sirikit National Institute of Child Health, College of Medicine, Rangsit University, Bangkok, Thailand*

Objective: *To show the success of air enema reduction for intussusception at Queen Sirikit National Institute of Child Health, a tertiary center for children in Bangkok, Thailand.*
Material and Method: *Medical records of patients treated for intussusception by air enema reduction between 1992 and 2009 were reviewed for the success rate.*
Results: *The treatment for intussusception at Queen Sirikit National Institute of Child Health was changed from barium enema to air enema reduction since 1992. And was the first institute in Thailand that performed air enema reduction by modified the instrument from blood pressure device. The result of success rate was 68% from the total of intussusception 737 cases with successful reduction of 498 cases. The pressure was not more than 120 mmHg. There was bowel perforation in 4 cases (0.5%) but no death occurred.*
Conclusion: *The success rate is not as high as other countries because of late presentation with small bowel obstruction. However, air enema reduction is a safe method and is the first method of choice before surgery. Early diagnosis and early treatment help the patient from surgery.*

Keywords: *Intussusception, Air enema reduction*

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Intussusception is a common but life threatening gastrointestinal emergency that occurs in infants and young children. The classical triad of intussusception are colicky abdominal pain, palpable mass and bloody stool[1]. It is one of the most common causes of intestinal obstruction in children under 2 years of age. Non-operative treatment by air enema reduction is now gaining popularity everywhere as an alternative method for barium enema reduction[2].

Thailand as other countries has changed the use of barium enema to air enema reduction. Queen Sirikit National Institute of Child Health (Children's Hospital) was the first institute in Thailand that performed air enema reduction by modification of sphygmomanometer for the air enema pressure device. The purpose of the present study was to show the success rate of air enema reduction from Queen Sirikit National Institute of Child Health, a referral center for children in Thailand.

Correspondence to:
Kruatrachue A, Department of Radiology, Queen Sirikit National Institute of Child Health, College of Medicine, Ransit University, Bangkok 10400, Thailand.
Phone: 0-2354-8344
E-mail: anchalek@childrenhospital.go.th

Material and Method

After the proposal (document no. 54-027) was approved by Institutional Review Board, a retrospective study was done by collecting all the cases of intussusception consulted from the surgical department since 1 January 1992 to 30 September 2009. The percentage of success rate was calculated. The device for air enema reduction was a modification of a sphygmomanometer, which has arm-cuff and pressure, and was shown by mercury in millimeters. The arm-cuff was disconnected and also the rubber bubble; then the close loop system was made by using the Y-shaped plastic tube. One limb of the Y-shaped plastic tube was connected with the tube of the urine bag and to Foley's catheter for rectal insertion. Another limb of the Y-shaped plastic tube connected with the rubber more than 120 mmHg. Sometimes sedation by diazepam 0.2 mg/kg was needed to calm the patient. The Foley's catheter size was 18 French or more. Ballooning about 20 cc with rectal strap and immobilization of the patient's

arm and knee were done. The operating room was available and standby if air enema reduction was unsuccessful.

Results

There were 737 cases of intussusception from January 1, 1992 to September 30, 2009. The successful cases by air enema reduction were 498. The success rate was 68% (Table 1).

The success reduction of intussusception was to show the head of intussuceptum had reached the small bowel and then the disappearance of this intraluminal mass. If intussusception was noted at hepatic flexure or transverse colon, easy reduction was achieved and the pressure was less than 80 mmHg (Fig. 1). In cases of complete small bowel obstruction, more attempts about 3 times were done and pressure was not more than 120 mmHg. Unsuccessful reduction was achieved in about half of the cases of small bowel obstruction (Fig. 2). Ultrasonography was not performed in all cases. If clinical was typical with palpable mass, air enema reduction was done for diagnosis and therapeutics. If clinical could not indicate palpable mass in cases of suspected intussusception, ultrasonography was performed to rule out or confirm diagnosis. The negative consultation of intussusception is about 10% for each year. Air enema was performed in all cases if plain abdomen shows no free air. There were 4 cases of complications due to perforation (Fig. 3) from 737 cases (0.5%).

Table 1. Result of air enema reduction of intussusception

AD	Number of cases	Success		Unsuccess	
		cases	%	cases	%
1992	36	27	75	9	25
1993	31	23	74	8	26
1994	29	23	79	6	21
1995	34	26	76	8	24
1996	28	18	64	10	36
1997	48	37	77	11	23
1998	37	23	62	14	38
1999	36	26	72	10	28
2000	38	23	61	15	39
2001	29	20	69	9	31
2002	34	18	53	16	47
2003	52	34	65	18	35
2004	54	32	59	22	41
2005	46	31	67	15	33
2006	67	44	66	23	34
2007	49	34	69	15	31
2008	33	23	70	10	30
2009	56	35	63	21	37
Total	737	498	68	239	32

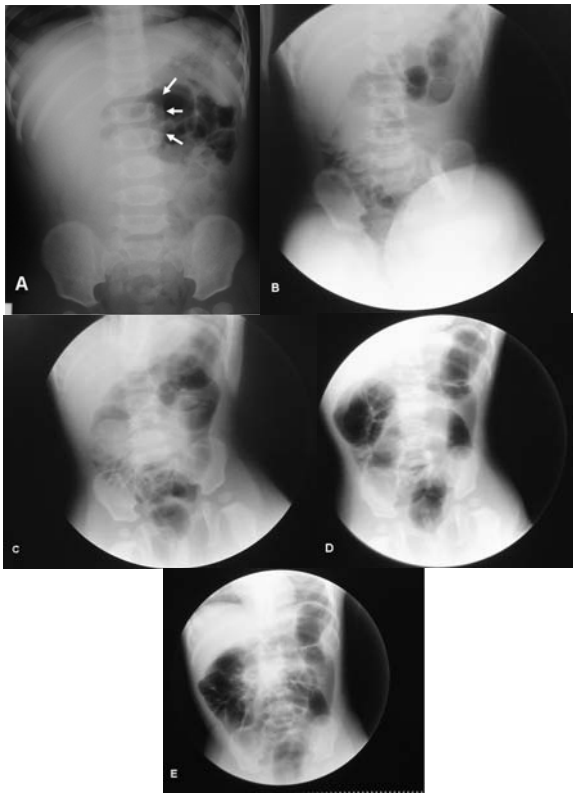

Fig. 1 Plain abdomen (A) shows a round soft tissue mass (the intussusceptum) protruding into the gas-filled transverse colon. Air enema reduction (B-E) shows successful reduction as seen the intraluminal mass was disappeared and air can pass freely to small bowel

Discussion

Intussusception represents the most common abdominal emergency in infancy. More than 90% of the cases were idiopathic. The remaining 10% of the cases with intussusception are secondary to Meckel's diverticulum, polyps, duplication, mesenteric cysts, intramural hematoma or lymphoma[3]. About 75% occur in patients under 2 years of age, 50% less than 1 year and 40% during the age of 3-9 months. The classical triad of intussusception, consisting of abdominal colic, currant jelly stool and a palpable mass were present. Vomiting was the most common symptom in about 90% at QSNICH[4]. In case of abdominal distension and mass is difficult to evaluate, ultrasonography is helpful to

Fig. 2 Plain abdomen (A,B) show dilatation of long loops of bowel of small bowel obstruction. Abdominal ultrasonography (C) shows doughnut sign. Air enema reduction (D-F) shows intussusception at transverse colon with unsuccessful reduction as air cannot pass to small bowel

demonstrate the doughnut sign or pseudokidney sign to confirm the diagnosis of intussusception before air enema reduction. At QSNICH, plain abdomen was taken of all the patients of intussuception, for the most important to sign of free air before air enema reduction. Because it is the contraindication for non-operative treatment, small bowel obstruction appeared more than soft tissue mass. However no free air was seen prior to the air enema reduction.

The success rate was 68%, 498 cases from 737 cases which is lower than many institutions with success rates ranging from 72%-95%[5]. This could be from more, small bowel obstruction than soft tissue mass at QSNICH. If plain film reveals an intraluminal mass at hepatic flexure, the success of air enema

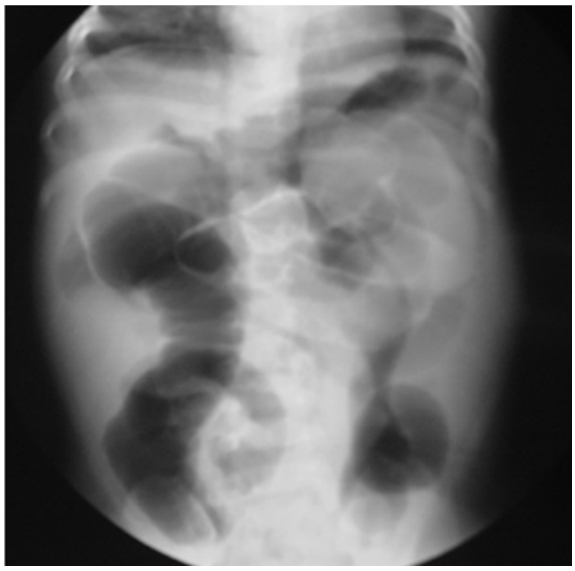

Fig. 3 Free air is seen during air enema reduction of the complicated air enema reduction

reduction will be achieved in most of the cases. In case of small bowel obstruction, the success rate was about half of the cases. Perforation was detected in 4 cases during air enema reduction from 737 cases (0.5%). The perforation rate is lower than the previous report of 1%-2.8%[6-8]. As mentioned by Lehnert et al[9] with a success rate of 78%, 66 out of 85 patients, using air enema reduction assumed that the delayed diagnosis of intussusception increases the incidence of surgical treatment and the risk of complications.

The diagnostic approaches by clinical diagnosis of ileocolic and ileoileocolic intussusception may be difficult to make. The classic clinical triad of abdominal pain, red currant jelly stool and palpable abdominal mass is present in fewer than 50% of children with this condition[10]. Failure to make a prompt diagnosis and initiate appropriate treatment may lead to bowel ischemia, perforation, peritonitis, shock and even death. The clinician, therefore, may have to rely on imaging procedures to diagnose or exclude the presence of intussusception promptly and accurately. The imaging diagnosis of intussusception can be made with sonography or plain abdominal radiograph or by contrast, including air, enema examination.

In the past 100 years radiologists and surgeons have modified techniques in an attempt to improve the effectiveness of attempted reduction of symptomatic, "idiopathic" ileocolic and ileoileocolic intussusceptions. Despite recent major advances in

anesthesia and the success achieved with surgical reduction, the non-operative enema technique of intussusception reduction has the major advantages of reducing invasiveness, morbidity, costs and length of hospital stay[11]. Anesthesia and surgery are not without their risks and handling of the bowel during attempted manual reduction may also tear the serosa and mucosa. The aim of the enema reduction technique is, therefore, to obviate the need for surgery in the greatest possible number of children with intussusception[5].

Therapy for childhood intussusception during the late 19th century varied from hydrostatic enema reduction with a column of water at least 10 feet high, to despair. Not until the 1870's was surgery successful[12].

In 1948 Ravitch and McCune[13] established criteria for the reduction of intussusception by barium enema. One of their guidelines was that the height of barium enema bag should not exceed $3_{1/2}$ feet above the top of the fluoroscopic table. At this level, they found that they could not reduce any intussusception that contained incarcerated or necrotic bowel. Since their work, hydrostatic enema reduction for intussusception has become common and perforate is rare. Air, not barium, has been the contrast agent of choice for intussusception in China reported in 1986[14,15]. In act, Florito[16], a Spanish radiologist, described a device that controlled insufflation of air for the diagnosis and treatment of childhood intussusception in 1959. Despite this extensive clinical experience, air intussusception reduction received little attention in North America until the late 1980s when Gu et al[17] presented clinical data on air intussusception reduction at International Pediatric Radiology in 1987 and received the John Caffey award. Over the next few years, several institutions in Australia[18] and the USA[19,20] replaced hydrostatic enema with air intussusception reduction for the diagnosis and treatment of pediatric intussusception. The reasons for changing are the improvement in reduction rates and less morbidity if perforation occurred[2]. Thailand as other countries, changed the use of barium for air. No mortality occurred in any patients of 737 cases. So air enema reduction has been the method of treatment for intussusception at QSNICH since 1992 and until now. Queen Sirikit National Institute of Child Health was the first institute in Thailand that performed air enema reduction using the modification of sphygmomanometer for the air enema pressure device. The patients under two years of age who presented with acute abdomen and vomiting, intussusception should be the first diagnosis. Further medical imaging by abdominal radiograph and air enema reduction should be performed to make early diagnosis and treatment.

Conclusion

Air enema reduction is a safe method for the treatment of intussusception and is widely used in many countries including Thailand. Early diagnosis and early treatment help the patient from surgical treatment.

Potential conflicts of interest

None.

References

1. Stringer MD, Pablot SM, Brereton RJ. Paediatric intussusception. Br J Surg 1992; 79: 867-76.
2. Kirks DR. Air intussusception reduction: "the winds of change". Pediatr Radiol 1995; 25: 89-91.
3. DiFiore JW. Intussusception. Semin Pediatr Surg 1999; 8: 214-20.
4. Niramis R, Watanatittan S, Anuntkosol M, Rattanasuwan T, Buranakitjaroen V. Intussusception: experience in 507 Thai pediatric patients. Thai J Surg 2001; 22: 123-30.
5. Daneman A, Navarro O. Intussusception. Part 2: An update on the evolution of management. Pediatr Radiol 2004; 34: 97-108.
6. Stein M, Alton DJ, Daneman A. Pneumatic reduction of intussusception: 5-year experience. Radiology 1992; 183: 681-4.
7. Maoate K, Beasley SW. Perforation during gas reduction of intussusception. Pediatr Surg Int 1998; 14: 168-70.
8. Palder SB, Ein SH, Stringer DA, Alton D. Intussusception: barium or air? J Pediatr Surg 1991; 26: 271-4.
9. Lehnert T, Sorge I, Till H, Rolle U. Intussusception in children—clinical presentation, diagnosis and management. Int J Colorectal Dis 2009; 24: 1187-92.
10. Daneman A, Navarro O. Intussusception. Part 1: a review of diagnostic approaches. Pediatr Radiol 2003; 33: 79-85.
11. Bruce J, Huh YS, Cooney DR, Karp MP, Allen JE, Jewett TC Jr. Intussusception: evolution of current management. J Pediatr Gastroenterol Nutr 1987; 6: 663-74.
12. Hutchinson J. A successful case of abdominal resection for intussusception. Proc R Med Chir Soc

1873; 7: 195-8.
13. Ravitch MM, McCune RM Jr. Reduction of intussusception by barium enema; a clinical and experimental study. Ann Surg 1948; 128: 904-17.
14. Guo JZ, Ma XY, Zhou QH. Results of air pressure enema reduction of intussusception: 6,396 cases in 13 years. J Pediatr Surg 1986; 21: 1201-3.
15. Zhang JZ, Wang YX, Wei LC. Rectal inflation reduction of intussusception in infants. J Pediatr Surg 1986; 21: 30-2.
16. Fiorito ES, Recalde Cuestas LA. Diagnosis and treatment of acute intestinal intussusception with controlled insufflation of air. Pediatrics 1959; 24: 241-4.
17. Gu L, Alton DJ, Daneman A, Stringer DA, Liu P, Wilmot DM, et al. John Caffey Award. Intussusception reduction in children by rectal insufflation of air. AJR Am J Roentgenol 1988; 150: 1345-8.
18. Phelan E, de Campo JF, Malecky G. Comparison of oxygen and barium reduction of ileocolic intussusception. AJR Am J Roentgenol 1988; 150: 1349-52.
19. Miles SG, Cumming WA, Williams JL. Pneumatic reduction of ileocolic intussusception in children. Pediatr Radiol 1988; 18: 3-5.
20. Bisset GS III, Kirks DR. Intussusception in infants and children: diagnosis and therapy. Radiology 1988; 168: 141-5.

ผลการใช้ลมสวนทางทวารหนักรักษาโรคลำไส้กลืนกันในผู้ป่วย 737 ราย

อัญชลี เครือตราชู, ลาวัณย์ ว่องตาประดิษฐ์, ณรงค์ นิธิปัญญา, วรางคณา รัตนปราการ

วัตถุประสงค์*: เพื่อแสดงผลการรักษาโรคลำไส้กลืนกันในเด็กโดยใช้ลมสวนทางทวารหนักจากสถาบันสุขภาพเด็กแห่งชาติมหาราชินี ซึ่งเป็นตติยภูมิการรักษาโรคเด็กของประเทศไทย*

วัสดุและวิธีการ*: เป็นการศึกษาย้อนหลังเชิงพรรณนา โดยรวบรวมผู้ป่วยที่มาทำการรักษาโดยใช้ลมสวนทางทวารหนักที่กลุ่มงานรังสีวิทยา ตั้งแต่เริ่มทำการรักษาด้วยวิธีนี้ตั้งแต่ปี พ.ศ. 2535 ถึงปี พ.ศ. 2552 และดูผลสำเร็จของการรักษาคิดเป็นร้อยละของการรักษาได้สำเร็จ*

ผลการรักษา*: มีผู้ป่วยโรคลำไส้กลืนกันทั้งหมด 737 ราย ทำการรักษาโดยใช้ลมสวนทางทวารหนักสำเร็จ 498 ราย คิดเป็นร้อยละ 68 โดยทางกลุ่มงานรังสีวิทยา สถาบันสุขภาพเด็กแห่งชาติมหาราชินี เป็นสถาบันแรกของประเทศไทยที่เปลี่ยนแปลงการรักษาจากการใช้แป้งแบเรี่ยมสวนทางทวารหนัก มาเป็นการใช้ลมสวนทางทวารหนัก ความดันลมที่ใช้ไม่เกิน 120 มิลลิเมตรปรอท มีการทะลุของลำไส้ 4 ราย คิดเป็นร้อยละ 0.5 ไม่มีผู้ใดเสียชีวิตที่ทำการรักษาด้วยวิธีนี้*

สรุป*: ผลสำเร็จของการรักษาต่ำกว่าต่างประเทศ เนื่องจากผู้ป่วยมาด้วยลำไส้อุดกั้นมากกว่าการมาในระยะเริ่มแรกเมื่อลำไส้เริ่มกลืนกัน การรักษาโดยใช้ลมสวนทางทวารหนักเป็นวิธีการรักษาที่ปลอดภัยและทำการรักษาด้วยวิธีนี้ก่อนวิธีอื่น และจะทำการผ่าตัดเมื่อทำการรักษาด้วยวิธีนี้ไม่สำเร็จ การวินิจฉัยโรคได้ถูกต้องในระยะเริ่มแรกและรีบทำการรักษาโดยใช้ลมสวนทางทวารหนักจะช่วยให้ผู้ป่วยไม่ต้องผ่าตัด*